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CHANGES IN THE EXPECTATION OF LIFE AMONG INDUSTRIAL POLICYHOLDERS, 1911 TO 1930

In the November issue of the STATISTICAL BULLETIN, we gave a brief survey of the progress in the expectation of life among Industrial policyholders of the Metropolitan Life Insurance Company in the past two decades. In this issue we publish, in greater detail, a table on which the figure then quoted for the expectation of life for the year 1930 was based. At the same time we give for comparison corresponding figures for the biennium 1911-1912, the earliest for which a life table has been computed by the Statistical Bureau of the Metropolitan Life Insurance Company; and also for the year 1921, which, like 1930, was an exceptionally good health year.

Expectation of Life in Years at Selected Ages Above 10 Years. By Color and Sex. Metropolitan Life Insurance Company, Industrial Department, 1911-1912, 1921 and 1930

AGE	TOTAL PERSONS			WHITE						COLORED					
				Males			Females			Males			Females		
	1930	1921	1911–1912	1930	1921	1911–1912	1930	1921	1911–1912	1930	1921	1911–1912	1930	1921	1911–1912
10	53.28	52.73	47.43	52.38	52.70	45.61	56.14	54.61	50.66	44.66	47.08	41.32	46.47	46.12	41.30
15	48.69	48.33	42.96	47.79	48.28	41.12	51.49	50.12	46.19	40.32	43.06	37.42	42.26	42.20	37.83
20	44.32	44.17	39.01	43.35	44.01	36.87	47.01	45.88	42.02	36.49	39.24	34.16	38.70	39.03	35.14
25	40.15	40.22	35.31	39.03	39.88	33.00	42.71	41.84	38.21	33.02	35.70	31.11	35.41	36.18	32.39
30	36.06	36.23	31.70	34.75	35.74	29.36	38.47	37.74	34.47	29.55	32.17	27.95	32.01	32.99	29.32
35	32.00	32.27	28.29	30.59	31.64	26.03	34.20	33.66	30.72	26.11	28.68	24.90	28.54	29.71	26.30
40	28.00	28.44	24.98	26.60	27.72	22.94	29.95	29.66	27.00	22.82	25.37	21.91	25.16	26.50	23.25
45	24.16	24.68	21.66	22.77	23.97	19.92	25.83	25.67	23.29	19.82	22.04	18.93	21.97	23.35	20.25
50	20.53	20.97	18.41	19.22	20.26	16.98	21.91	21.81	19.67	17.04	18.74	16.09	18.88	20.22	17.34
55	17.14	17.47	15.32	16.02	16.79	14.14	18.22	18.13	16.32	14.43	15.75	13.48	15.99	17.29	14.60
60	14.02	14.20	12.47	13.15	13.64	11.50	14.83	14.68	13.20	11.92	13.06	11.21	13.41	14.61	12.20
65	11.21	11.27	9.99	10.53	10.90	9.19	11.82	11.59	10.51	9.66	10.57	9.30	11.16	11.91	10.21
70	8.81	8.81	8.02	8.25	8.58	7.30	9.28	9.04	8.41	7.86	8.49	7.69	9.30	9.65	8.61

The comparison of 1930 with 1911–1912 is favorable all along the line, as is naturally to be expected. The comparison between 1921 and 1930 presents a rather different picture, with actual losses in the expectation of life for males, especially among colored males. One result of this is that the expectation of life for females is now in considerably greater excess of that for males than it was in 1921, although it has not fully returned to the ratio corresponding to 1911–1912. The detailed facts are set forth in the second table, which gives the expectation of life for females at successive decennial ages, from 20 to 70, expressed on a percentage basis in terms of the corresponding expectation of life for males=100.

Percentage Female of Male Expectation of Life. Metropolitan Life Insurance Company, Industrial Department, 1911-1912, 1921 and 1930 at Adult Ages

Age	White			Colored		
	1930	1921	1911–1912	1930	1921	1911–1912
20	108.4	104.2	114.0	106.1	99.5	102.9
30	110.7	105.6	117.4	108.3	102.5	104.9
40	112.6	107.0	117.7	110.3	104.5	106.1
50	114.0	107.7	115.8	110.8	107.9	107.8
60	112.8	107.6	114.8	112.5	111.9	108.8
70	112.5	105.4	115.2	118.3	113.7	112.0

Male=100.0

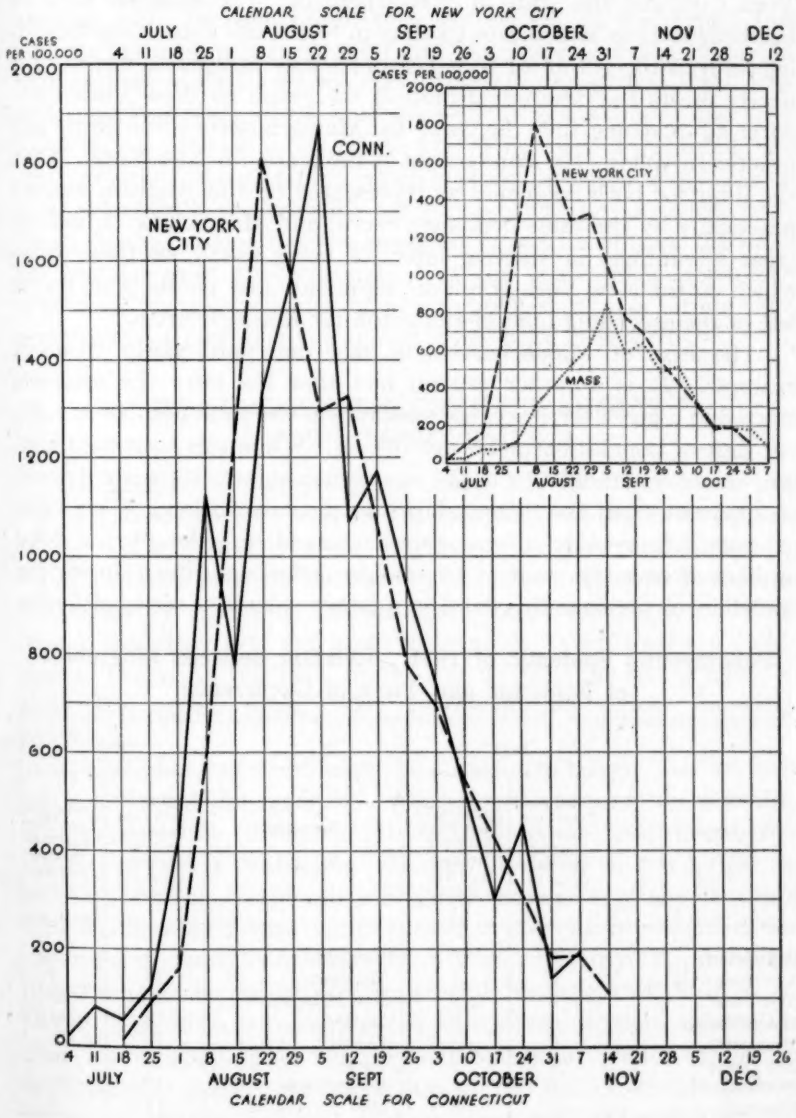
FURTHER CHARACTERISTICS OF THE 1931 POLIOMYELITIS EPIDEMIC

As was pointed out in the November issue of the Statistical Bulletin, the States of Connecticut and New York were the hardest hit by the recent poliomyelitis epidemic. In the worst week of this epidemic Connecticut had 162 cases, which corresponds to an annual rate of 1,877 cases per 100,000 children under age fifteen. New York City had 591 cases at the height of the epidemic there, corresponding to an annual rate of 1,809 per 100,000 children under fifteen years. New York State had in its worst week 676 cases, corresponding to 1,105 per 100,000 children under age fifteen.

A feature of particular interest in the recent epidemic becomes apparent when the epidemic waves (reckoned in terms of the annual case rate per 100,000 children under fifteen) for Connecticut and for New York City are compared week by week as in the body of the accompanying diagram. The graph for New York City is here shown

POLIOMYELITIS EPIDEMIC 1931

Cases per 100,000 children under 15 years
By weeks on annual basis
CONNECTICUT, NEW YORK CITY, MASSACHUSETTS



Metropolitan Life Insurance Company

on a scale shifted by two weeks to the right of the scale for Connecticut. It will be seen that, apart from this small shift, the two waves are almost identical in shape.

In the insert in the upper right hand corner of the illustration another interesting comparison is shown—namely, that between New York City and the State of Massachusetts. The epidemic took on headway later in Massachusetts than in New York City. The ascending limb of the graph for Massachusetts may be seen to rise until it nearly meets the descending limb of the graph for New York City. After approaching this, the curve for Massachusetts turns down and practically follows the same course as the graph for New York. Thus the limit for both epidemics as represented on this diagram was set practically by the same boundary curve; and Massachusetts had the great advantage, in starting later, of being saved all those cases which on the New York graph are represented by points lying to the left of the ascending limb of the graph for Massachusetts.

The case of Massachusetts is only one particularly clear-cut example. It is a rather general fact that the later the epidemic started in a given territory, the smaller was the total number of cases per unit of population under age fifteen. While this statement cannot be taken literally to apply in every instance, its general truth is apparent from the figures shown in the table below. This table exhibits side by side fifteen states arranged in order of the total number of cases per unit of population under age fifteen during the epidemic of poliomyelitis; and in another column a series of figures

Poliomyelitis Epidemic of 1931. Relation between Magnitude of Epidemic and Time of Occurrence

Locality	Rank		Locality	Rank	
	According to Total Case Rate per 100,000 Children under 15 Years	According to Time When Epidemic Reached Half-Way Point		According to Total Case Rate per 100,000 Children under 15 Years	According to Time When Epidemic Reached Half-Way Point
Connecticut	1	5	Vermont	9	10
New York City	2	1	Michigan	10	9
New York	3	3	New Hampshire	11	12
Massachusetts	4	6	Maine	12	14
Minnesota	5	13	Illinois	13	11
New Jersey	6	7	Iowa	14	16
Rhode Island	7	2	Pennsylvania	15	15
Wisconsin	8	8	Ohio	16	4

indicating the chronological order in which the first half of the epidemic was completed in the several states. It will be seen that in a general way, the earlier this half-way stage was reached, the larger was the total number of cases per unit of population under age fifteen. While this is to some extent immediately apparent to the eye in consulting the table, the correlation is capable of quantitative measure. By the method of rank correlation, it was found that between the rank as regards total number of cases per unit of population, and the rank as regards chronological order in which the half-way stage was reached, the epidemics in the several states and territories had a correlation of $.62 \pm .11$. This may be regarded as a fairly pronounced correlation, which is probably significant. Clearly, if an epidemic of poliomyelitis cannot be completely avoided, every effort should, at any rate, be made to retard its progress as much as possible, since the termination of the epidemic is apparently determined by a seasonal factor which cuts it short at a certain time, irrespective of how long the epidemic has been in progress.

HAS MATERNAL MORTALITY SHOWN A TRUE IMPROVEMENT?

The deathrate from puerperal causes has for many years past shown a steady decline, as is seen in column (2) of the accompanying table. These figures give the deathrate from puerperal causes per 100,000 women between the ages of fifteen and forty-four years in the population of the ten Original Birth Registration States. It will be seen that since 1915 and up to the year 1929 there has been a very marked decline in this rate, from 63 or more to the recent figure of 47.4. The series, since 1921, represents an almost unbroken progression.

At first impression one might be disposed to believe that we have here a very gratifying record of a steady improvement in the mortality in connection with childbirth. Unfortunately, on closer examination this record proves misleading. It must be borne in mind that the birthrate has been steadily declining and, consequently, the frequency with which women have been exposed to the risk of childbirth has also been declining. Accordingly, a more indicative figure of the true condition is the ratio of puerperal deaths per thousand live births. This ratio is shown for the same series of years and for the same ten Original Birth Registration States in column (3) of the accompanying table. An inspection of the figures in this column shows an entirely different picture from that presented by the

mortality rate from puerperal causes per 100,000 females of childbearing ages. In fact the series of figures in the column headed Puerperal Deaths per 1,000 Live Births is about as constant as such statistical series can well be expected to be, except only in the years 1918 to 1920 which are clearly affected by influenza epidemics. A trend line has been computed for this series of figures and its slope is found to be —.000018 $\pm$ .0090, which, of course, is practically horizontal, the deviation from the horizontal being quite insignificant. The best, therefore, that we can say on the basis of these figures alone is that there has been no actual retrograde movement in the risks attending childbirth; of progress in this matter, our figures *so far* give no indication.

These figures, however, are presented merely as a provisional report based on the simplest form of data, without any attempt at deep analysis. In actual fact the problem of the maternal deathrate is a rather complicated one, involving not only the declining birthrate, but also the change in the average age at marriage, the change in the size of families and accordingly in the proportion of first births (which are well known to present the greatest risk to the mother), and in a number of other factors which would have to be taken into account in a complete discussion of the problem. As to the proportion of first births in total births, this has risen in the past with the d clining birthrate, since this decline is due, not to a reduction in the number of families, but to a reduction in the average number of children per family. What this reduction amounts to can be seen in column (4) of the appended table. This shows that since 1917 the proportion of first children among total births in each year has risen from .277 to .309, or by just about 10 per cent. In view of this increase in the proportion of first children, and the accompanying increase in the risk to the mother, the fact that the proportion of puerperal deaths to live births has remained constant, may after all be regarded perhaps as indicating a slight gain. But, clearly, this gain is nothing like as great as would appear on a casual inspection of the figures for the deathrate from puerperal causes shown in column (2) of the table on page 7.

The interesting problem which is here merely touched upon, is being investigated in greater detail under a grant of the American National Committee of the International Union for the Scientific Investigation of Population Problems, by a graduate student working at the London School of Economics, where special facilities are available for analyzing the exceptionally well documented

sources of British statistics available through official and private agencies.

Deaths from Puerperal Causes per 100,000 Female Population of Ages 15 to 44, Compared with the Same Deaths per 1,000 Live Births. United States Birth Registration States of 1915, Calendar Years 1915 to 1929

Calendar Year	Deaths per 100,000 Female Population of Ages 15 to 44	Deaths per 1,000 Live Births	Per Cent. First Children Among Total Births
1929	47.4	*	*
1928	49.9	6.14	30.86
1927	53.1	6.25	30.17
1926	52.9	6.18	29.51
1925	55.2	6.16	29.43
1924	58.4	6.24	29.21
1923	59.2	6.37	27.81
1922	58.4	6.23	28.75
1921	65.5	6.54	29.78
1920	75.6	7.62	29.04
1919	64.9	6.82	24.14
1918	92.0	8.90	27.81
1917	65.7	6.26	27.74
1916	64.5	6.21	*
1915	63.1	6.08	*

*Data not available

HEALTH RECORD FOR NOVEMBER, 1931

In no previous November have health conditions among Metropolitan Industrial policyholders been as favorable as during that month in 1931. The deathrate was 7.7 per 1,000, as compared with the previous minimum of 7.8, in November, 1930. In only one other November (in 1924) has the deathrate among insured wage earners fallen below eight per 1,000.

The cumulative deathrate for the eleven elapsed months of 1931 is only two-tenths of 1 per cent. above the minimum—recorded in 1930. Furthermore, in December, 1931, lower mortality rates than those of December, 1930, prevailed, up to the middle of the month. It is thus entirely possible that this slightly adverse margin will be wiped out by the end of the year. Mortality data for the general population of certain large cities show, up to the end of the 47th week, a cumulative deathrate of only 11.8 per 1,000, as compared with 11.9 for the corresponding period of 1930, thus indicating that the excellent health conditions prevailing among insured wage earners, in 1931, have also obtained for the population in general. Among

the insured who live in the Pacific Coast and Mountain States, and among those in Canada, markedly lower November deathrates were registered than ever before, and the cumulative mortality for each of these large regions, up to the end of November, was well below the previous minimum. Three of the eleven elapsed months of 1931, May, August and November, have recorded lower deathrates this year than ever before, while the 1931 figure for October was identical with the previous low point, registered in 1927.

With respect to four diseases, the facts are so clear-cut that it is possible to announce, even before the close of the year, that the lowest mortality rates recorded to date will be registered this year. These are diphtheria, tuberculosis, diarrheal complaints and puerperal conditions. There is also every prospect that a new minimum will be shown for typhoid fever, and there is an excellent chance that the mortality from chronic nephritis will be lower than ever before.

The reduction in the diphtheria deathrate, up to the end of November, amounted to 28 per cent. The mortality from this disease has been reduced more than one-half in the brief period of two years; more than two-thirds in seven years; and the deathrate is now less than one-sixth the figure recorded twenty years ago. With the single exception of typhoid fever, diphtheria has recorded a greater per cent. reduction in its deathrate, since 1911, than has any other cause of death. The mortality for measles and scarlet fever is running a little higher than in 1930, but the deathrate for each is well below the average for the past ten years; and in the case of each, the rate represents only a small fraction of the figure registered twenty years ago. The whooping cough mortality rate is about at the average for the past decade.

A very unusual development this year is an actual reduction in the pneumonia deathrate in the face of a marked rise in that for influenza. Even during the influenza outbreak of last winter, the pneumonia mortality did not increase to the extent usually observed during former periods of widespread prevalence of influenza; and after the epidemic had run its course, every month recorded a lower pneumonia deathrate than did the corresponding month of 1930.

On the other side of the picture, no doubt remains that new maximum deathrates will be registered, in 1931, for cancer, diabetes and automobile fatalities. The heart disease mortality rate will probably be higher than ever before.

Paradoxical as it may seem, diabetics, despite the increase in the deathrate for the disease, are now living longer than ever before.

In fact, there is good evidence that the average duration of life, from the onset of the disease, to death, has increased from five years (before the discovery of insulin) to eight years. The rise in the deathrate from diabetes has been confined to the older age groups, where insulin, unfortunately, is not given so generally as at the lower ages. The influenza outbreak of last winter hastened the deaths of many diabetics and is, in large part, responsible for the considerable rise in the diabetes deathrate this year. Influenza was also the chief factor in the increase observed during 1931 in deaths from cardiac diseases. The rise in the deathrate for automobile fatalities, up to the end of November, amounted to 5.9 per cent. The steadily rising mortality from this type of accidents is becoming each year a matter of graver concern to those responsible for the public safety. To date, this year, 36 per cent. of all accidental deaths among the Industrial policyholders have occurred in motor vehicle accidents.

The deathrate in the general population of the large cities in the United States, in November, was 10.9 per 1,000 estimated population, as compared with 10.2 in October and 11.8 in November a year ago. There was increased prevalence during November, as compared with October, of diphtheria, influenza, measles, scarlet fever and smallpox, but there were fewer cases of poliomyelitis and typhoid fever. Comparison with November of last year shows more cases of diphtheria, measles and scarlet fever, with lower incidence of influenza, poliomyelitis, smallpox and typhoid fever. These statements are based on the number of cases reported during the first four weeks of October and November, 1931, and of November, 1930.

The increases in the morbidity from diphtheria, influenza, measles and scarlet fever are seasonal. This is also true, in a lesser degree, of smallpox; but for this last disease the increase is much larger than we would expect to result from the seasonal factor alone, namely, from 406 cases in October to 1,032 in November. The more noteworthy rises recorded for smallpox were in Iowa, New York, Ohio, North Dakota and Michigan.

Cases of poliomyelitis, in November, as reported from 47 states, totaled less than one-third the number reported in October. In fact, despite the severe epidemic conditions that prevailed during the summer months of 1931, the poliomyelitis situation has now adjusted itself to a point where cases of the disease reported in November were actually one-third less than in the same month of last year.

Among the more noteworthy health activities of the month were the following: In Indiana, according to newspaper reports, the

Medical Service Committee of the Governor's Unemployment Relief Commission is conducting a survey of methods of providing medical care for the sick among the state's poor. This work is being done to determine the manner in which township trustees and the medical profession in each locality are handling poor relief work; and to ascertain the cost of service and the amount of free work done by the medical profession in each county. In Pittsburgh and Allegheny County, Pennsylvania, health and welfare agencies have organized a General Health Council as a coordinating body for their activities. The UNITED STATES PUBLIC HEALTH SERVICE and the INDIANA STATE BOARD OF HEALTH are cooperating with local officials and health agencies, in a number of counties, in order to meet health needs in the drought area. Immunization programs against diphtheria, typhoid and smallpox are being carried out.

The following table shows the mortality among Industrial policyholders for November, 1931; October, 1931, and November, 1930, together with the cumulative rate for the first eleven months of each year.

METROPOLITAN LIFE INSURANCE COMPANY

Deathrates* per 100,000 for Principal Causes, Premium-Paying Business in Industrial Department (Annual Basis)

MONTHS OF NOVEMBER, 1931; OCTOBER, 1931, AND OF NOVEMBER, 1930

CAUSES OF DEATH	ANNUAL RATE PER 100,000 LIVES EXPOSED*				
	Nov. 1931	Oct. 1931	Nov. 1930	Cumulative, January to November	
				1931	1930
TOTAL—ALL CAUSES	771.6	780.2	775.2	876.3	874.8
Typhoid fever	2.2	4.9	2.7	2.2	2.3
Measles	.6	.5	.2	3.2	3.0
Scarlet fever	2.0	1.9	2.1	3.1	2.5
Whooping cough	2.9	3.3	2.3	3.6	4.4
Diphtheria	7.6	4.0	5.8	4.2	5.8
Influenza	8.1	5.2	10.9	21.1	14.5
Tuberculosis (All forms)	66.9	70.9	65.8	76.1	81.6
Tuberculosis of resp'y system	59.3	63.0	58.0	67.2	71.1
Cancer	83.6	79.7	72.2	82.4	77.7
Diabetes mellitus	20.5	18.4	16.3	20.6	18.4
Cerebral hemorrhage	54.6	55.7	56.1	60.6	60.1
Organic diseases of heart	131.0	125.8	131.8	147.1	144.3
Pneumonia (All forms)	56.3	41.3	67.4	74.7	75.9
Other respiratory diseases	8.3	8.4	9.4	10.3	11.1
Diarrhea and enteritis	12.2	27.0	19.2	16.1	21.1
Bright's Disease (Chronic nephritis)	65.2	58.4	61.4	66.2	67.7
Puerperal state	8.8	10.0	8.7	11.0	12.1
Suicides	8.0	10.0	9.7	9.7	9.7
Homicides	5.6	8.3	5.9	6.9	6.6
Other external causes (excluding suicides and homicides)	56.1	57.0	54.2	60.7	62.5
Traumatism by automobiles	23.0	25.4	21.3	21.7	20.5
All other causes	171.0	189.4	173.2	196.4	193.7

*All figures in this table include insured infants under one year of age. The rates for 1931 are subject to slight correction, since they are based on provisional estimates of lives exposed to risk.

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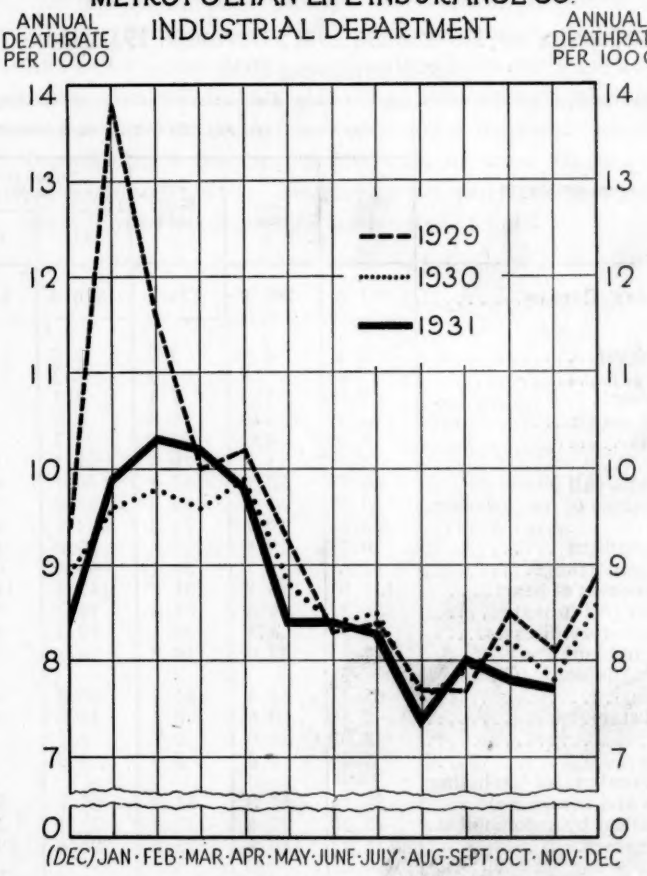
DEATHRATES
FROM ALL CAUSES

METROPOLITAN LIFE INSURANCE CO.
INDUSTRIAL DEPARTMENT



1929	13.8	11.6	10.0	10.2	9.2	8.3	8.4	7.7	7.7	8.5	8.1	8.9
1930	9.6	9.8	9.6	9.9	8.8	8.4	8.5	7.6	7.9	8.2	7.8	8.6
1931*	9.9	10.3	10.2	9.8	8.4	8.4	8.3	7.4	8.0	7.8	7.7	

*Rates for 1931 are provisional

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INDEX* FOR 1931

Accidental falls, in old age ... 3:5
——, 1930 ... 1:8
Accidents, in old age ... 3:5,6
——, seasonal incidence ... 8:4
——, 1922-1930 ... 11:5
——, in public places ... 11:4
——, 1925-1930 ... 6:3
——, fatal, in the home ... 9:3
——, 1930 ... 1:2,7
——, amount disbursed in death claims ... 2:4
——, occupational ... 10:8
——, 1931 ... 2:9; 3:9; 4:9; 5:9; 7:9; 8:9; 9:10
Alabama State Board of Health ... 2:10
Alcohol, wood and denatured, poisoning, 1930 ... 2:6
Alcoholism, slight decline in deathrate, 1930. 1:7
American Child Health Association ... 7:4
American Committee on the Control of Rheumatism ... 8:4
American Gas Association ... 9:5
American Oncological Hospital, cancer control center ... 6:10
American Public Health Association ... 7:4
——, Committee on Administrative Practice 7:6
American Social Hygiene Association ... 7:4
American Society for the Control of Cancer ... 5:10
Amounts paid to beneficiaries, M. L. I. Co., 1930 ... 2:3
Automobile accidents, in old age ... 3:6
——, 1925-1930 ... 6:3
——, 1930 ... 1:9
——, amount disbursed in death claims ... 2:4
——, 1931 ... 2:9; 3:9; 4:9; 5:10; 6:9; 7:9,11; 8:9; 9:10; 10:5,10; 11:9; 12:8,9
Baker, O. E. ... 5:7
Baltimore Health Department Survey ... 7:13
Bloodgood, Joseph C. ... 8:7
Boston Edison Electric Illuminating Company ... 8:4
Bureau of Industrial Hygiene, New York State Department of Labor ... 4:10
Cancer, American Society for the Control of ... 5:10
Cancer, clinic, in New Hampshire ... 7:13
——, control center, American Oncological Hospital ... 6:10
——, deathrate and aging population ... 9:5
——, 1925-1930 ... 6:1
——, amount disbursed in death claims, 1930 ... 2:3
——, retarded rate of increase ... 1:4
——, 1931 ... 2:9; 4:6,7; 6:9; 7:8,9,11; 8:8; 9:9; 10:4,10; 11:9; 12:8
——, geographical distribution ... 11:6
——, high deathrate ... 8:1
——, rise in deathrate ... 11:6
Cerebral hemorrhage, amount disbursed in death claims, 1930 ... 2:3
——, 1931 ... 2:9; 3:9; 4:8; 7:8,9; 8:9; 10:1,4
Chicago Department of Health ... 2:10
Child Guidance Clinic ... 5:10
Child Health and Protection, White House Conference on ... 7:5
Child Welfare Commission, Connecticut ... 6:9
Children's Fund of Michigan ... 5:10
Children, acute poisoning ... 2:6
——, heart disease, Chicago, 1930 ... 2:10
Cirrhosis of liver, 1930 ... 1:7
Claim payments to beneficiaries, 1930, for each important cause of death ... 2:3
Columbia University ... 8:10
Committee on the Cost of Medical Care. 7:6
Commonwealth Fund ... 4:10; 11:10
——, health project in Mississippi ... 11:10
——, pneumonia study in Massachusetts ... 11:10
Conference of State and Territorial Health Officers ... 6:10
County health service, Maryland ... 11:10
Cozzens Fund ... 8:10
Crippled children hospitals, etc., in Kansas. 6:9
Deathrate, all causes, M. L. I. Co. Industrial Department, 1911-1930 ... 6:5
——, sex and age ... 6:6
——, by seasons, 1923-1930 ... 8:6
——, lowest in summer ... 8:4
——, Canada, 1925-1930 ... 6:1
Defective delinquents hospital ... 6:10
Diabetes, new aspects ... 4:1
——, sex, age and color, 1911-1930 ... 5:2,3
——, trends in mortality ... 5:1
——, effect of insulin, 1930 ... 1:5
——, 1931 ... 4:6,7; 5:9; 6:9; 7:8,9,11; 8:8; 9:9; 10:1,4; 11:9; 12:8,9
Diarrheal diseases, seasonal incidence ... 8:4,5
——, 1930 ... 1:2,7
——, 1931 ... 4:9; 5:9; 7:9,11; 8:9; 9:9; 10:4; 11:9; 12:8
Diphtheria, decline in principal countries since 1920 ... 7:11
——, 1920-1929 ... 7:12
——, immunization ... 7:11
——, 1930 ... 1:2,10; 6:1
——, amount disbursed in death claims ... 2:4
——, decline in deathrate ... 1:4
——, geographical distribution ... 1:10
——, new minimum deathrate ... 1:3
——, 1931 ... 2:9; 3:9; 4:7,9; 5:9,10; 6:8; 7:9,12; 8:8,9; 9:9,10; 10:2,10; 11:9; 12:8,9
——, antitoxin, free distribution in Kansas. 5:10
——, geographical distribution ... 2:10; 3:9; 4:10; 7:12; 8:9; 11:9
Dublin, Louis I. ... 5:8
Expectation of life, historical retrospect of, 1911-1930 ... 11:7
——, sex, age and color, 1911-1912, 1921, 1930 ... 12:1
Families, survival of, U. S., 1920 ... 4:3
Fertility, native and foreign born women, U. S., 1920 ... 3:6
——, by age, Birth Registration Area ... 3:8
First International Congress of Mental Hygiene ... 3:10
Fisher, R. A. ... 5:7
Frankel, Lee K., 1867-1931 ... 7:2
——, health work with M. L. I. Co. Industrial Department ... 7:2,3,4,5,6,7
Framingham Demonstration for the Control of Tuberculosis ... 7:5,6
Freeman, A. W. ... 11:3
Frost, Wade H. ... 11:3
General Federation of Women's Clubs. 3:5
General Health Council, Pittsburgh and Allegheny Co., Pa. ... 12:10
Georgia State Board of Health ... 1:10
Georgia State Health Commission ... 2:10
Governor's Unemployment Relief Commission in Indiana, Medical Service Committee ... 12:10
Harkness, Edward S. ... 8:10
Hays, Will ... 7:5
Health examinations in New York City ... 6:10
Heart disease, study of morbidity in New York State ... 6:10
——, 1925-1930 ... 6:2
——, amount disbursed in death claims, 1930 ... 2:3
——, Chicago school children ... 2:10
——, decline in early ages ... 1:5
——, increase above age 45 ... 1:6
——, leading cause of death ... 1:5
——, 1931 ... 2:9; 3:9; 4:7; 7:8,9,11; 8:9; 10:1,4; 11:9; 12:8,9
Homicides, 1925-1930 ... 6:3
——, amount disbursed in death claims, 1930 2:5
——, 1931 ... 2:9; 3:9; 4:9; 5:9,10; 6:9; 7:9,11; 8:9; 9:10; 10:5
Hooper Foundation for Medical Research, University of California ... 4:10

*Figures in boldface denote numeral of month; roman figures refer to page number.

Indiana State Board of Health, health needs in drought area ... 12:10
Indiana Medical Service Committee, Governor's Unemployment Relief Commission ... 12:10
INDUSTRIAL COMMITTEE OF THE INSTITUTE OF HUMAN RELATIONS, YALE UNIVERSITY. 3:10
Influenza, seasonal incidence ... 3:4,5
——, 1930 ... 1:10; 6:1
——, amount disbursed in death claims ... 2:4
——, geographical distribution ... 1:10
——, new minimum deathrate ... 1:4
——, 1931 ... 2:8,9; 3:9; 4:6,7,9; 5:8,9,10; 6:8,9; 7:8,9,12; 8:8,9; 9:9,10; 10:1,4,10; 11:9; 12:8,9
——, geographical distribution ... 2:9; 3:10; 4:10; 5:10; 11:10
INTERNATIONAL COMMITTEE FOR MENTAL HYGIENE ... 3:10
INTERNATIONAL UNION FOR THE SCIENTIFIC INVESTIGATION OF POPULATION PROBLEMS 5:8
——, AMERICAN NATIONAL COMMITTEE OF ... 12:6
JOSLIN, ELLIOTT P. ... 4:1,3
LAVINDER, C. H. ... 11:3
LONDON SCHOOL OF ECONOMICS ... 12:6
LOTKA, ALFRED J. ... 5:8
MALTHUS, THOMAS ROBERT ... 5:7
Maryland, county health service ... 11:10
MATERNITY CENTER ASSOCIATION OF NEW YORK CITY ... 1:7
Measles, 1930 ... 1:2,10
——, geographical distribution ... 1:10
——, new minimum deathrate ... 1:3
——, 1931 ... 2:9; 3:9; 4:7,9; 5:10; 6:9; 7:9,12; 8:9; 9:9,10; 10:10; 11:9; 12:8,9
——, geographical distribution ... 2:9; 3:10; 4:10; 5:10; 7:12; 8:9; 11:10
MENTAL HYGIENE, FIRST INTERNATIONAL CONGRESS OF ... 3:10
——, INTERNATIONAL COMMITTEE FOR ... 3:10
M. L. I. Co. Industrial Dept., mortality, 1923-1930 ... 8:6
——, 1930 ... 1:1,9
——, 1931 ... 2:8; 3:8; 4:9; 5:8; 6:8; 7:11; 8:8; 9:8; 10:10; 11:8; 12:7
——, January to March ... 4:6
——, January to June ... 7:7
——, January to September ... 10:1
Michigan, county health work ... 8:10
Mortality, M. L. I. Co. Industrial Dept., causes of death, 1911-1929, industrial and general populations compared ... 1:9
——, 1930 ... 1:1,9
——, 1931 ... 2:8; 3:8; 4:9; 5:8; 6:8; 7:11; 8:8; 9:9; 10:10; 11:9; 12:8
——, January to March ... 4:6
——, January to June ... 7:7
——, January to September ... 10:1
Medical examinations, periodic ... 8:6
NATIONAL CONFERENCE ON SOCIAL WORK ... 7:7
NATIONAL HEALTH COUNCIL ... 7:4
NATIONAL ORGANIZATION FOR PUBLIC HEALTH NURSING ... 7:4
NATIONAL SAFETY COUNCIL ... 10:8
NATIONAL TUBERCULOSIS ASSOCIATION ... 7:4
Negroes, mortality among, 1911-1930 ... 10:5
——, by sex and age ... 10:7
——, chronic nephritis among, 1931 ... 7:8
——, heart disease among ... 7:8
——, mortality among ... 7:8
Nephritis, chronic, 1925-1930 ... 6:1
——, 1930 ... 1:5,6
——, amount disbursed in death claims ... 2:3
——, 1931 ... 3:9; 4:8; 7:8,11; 10:1,4; 12:8
New York State Board of Social Welfare ... 7:5,7
New York State Conference of Charities and Corrections ... 7:7
New York State Department of Health ... 1:10
New York State Health Commission ... 3:10
Occupational accidents, 1922-1930 ... 10:9
——, decrease of, 1930 ... 10:8
Orphanhood, average duration ... 2:6
——, by age ... 2:8
Pneumonia, 1930 ... 1:2
——, amount disbursed in death claims ... 2:4
——, new minimum deathrate ... 1:4
——, 1931 ... 4:6; 5:9; 6:9; 7:11; 10:1,4; 12:8
Poisoning, acute ... 2:5,6
——, children ... 2:6
Poliomyelitis, epidemics of 1916 and 1931 compared ... 11:1
——, geographical distribution ... 11:1,2
——, 1930 ... 1:10
——, geographical distribution ... 1:10
——, 1931 ... 2:9; 3:9; 4:9; 5:10; 6:9; 7:12; 8:8,9; 9:10; 10:4,10; 11:9; 12:9
——, epidemic of ... 12:2
——, Connecticut ... 12:3
——, geographical distribution ... 2:10; 3:10; 4:10; 7:13; 8:9; 10:10; 11:10; 12:4
——, Massachusetts ... 12:3
——, New York City ... 12:3
Population, London meeting on problems ... 5:7
POPULATION PROBLEMS, INTERNATIONAL UNION FOR THE SCIENTIFIC INVESTIGATION OF ... 5:8
Psychiatric Hospital, Pennsylvania State ... 8:10
PUBLIC HEALTH NURSING, NATIONAL ORGANIZATION FOR ... 7:4
Puerperal diseases, 1915-1929 ... 12:5
——, decline in deathrate, Original Birth Registration States ... 12:5
——, amount disbursed in death claims, 1930 ... 2:4
——, new minimum deathrate ... 1:6; 6:1
——, 1931 ... 2:9; 3:9; 4:9; 5:9; 6:8; 7:9; 8:9; 9:9; 10:4; 11:9; 12:8
Rheumatic disease ... 8:2
——, economic loss from ... 8:4
RHEUMATISM, AMERICAN COMMITTEE ON THE CONTROL OF ... 8:4
ROCKEFELLER FOUNDATION ... 8:10
ROCKEFELLER INSTITUTE ... 8:10
Scarlet fever, 1930 ... 1:2,10; 6:1
——, geographical distribution ... 1:10
——, new minimum deathrate ... 1:3
——, 1931 ... 2:9; 3:9; 4:7,9; 5:10; 6:9; 7:9,12; 8:9; 9:9,10; 10:10; 11:9; 12:8,9
——, geographical distribution ... 2:10; 4:10; 5:10; 7:12; 8:9; 11:9
Septic sore throat reportable in California ... 7:13
Smallpox, 1930 ... 1:10
——, American and Canadian Cities ... 5:6
——, American States and Canadian Provinces ... 5:3
——, 1931 ... 2:9; 3:9; 4:9; 5:10; 6:9; 7:12; 8:9; 9:10; 10:10; 11:9; 12:9
——, geographical distribution ... 2:10; 3:10; 4:10; 5:10; 6:9; 7:13; 8:9; 11:10; 12:9
——, vaccine, free distribution in Kansas ... 5:10
SOCIAL WORK, NATIONAL CONFERENCE ON ... 7:7
SOUTHERN PACIFIC COMPANY ... 4:10
Suicides, 1925-1930 ... 6:2
——, amount disbursed in death claims, 1930 ... 2:4
——, increase in ... 1:7
——, 1931 ... 2:9; 3:9; 4:9; 5:10; 6:9; 7:9,11; 8:9; 9:10; 10:5
Tuberculosis, seasonal incidence ... 8:5
——, 1910, 1915, 1920, 1925, 1929 ... 3:2
——, by occupations ... 3:2
——, by states ... 3:2
——, urban and rural, 1910, 1929 ... 3:3
——, by color, sex and age, 1911-1930 ... 2:2
——, decline of mortality ... 2:1; 3:1; 9:1
——, 1930 ... 1:2,3; 6:1
——, amount disbursed in death claims ... 2:4
——, new minimum deathrate ... 1:2
——, 1931 ... 2:9; 3:9; 4:6,7; 5:9; 6:8; 7:8,11; 8:8; 9:9; 10:2; 11:9; 12:8
TULANE UNIVERSITY, public health education ... 11:10
Tumor clinics in Chicago ... 6:10
Typhoid fever, seasonal incidence ... 8:5
——, 1930 ... 1:2,3,10; 6:1
——, amount disbursed in death claims ... 2:4
——, 1931 ... 2:9; 3:9; 4:9; 5:9,10; 6:9; 7:9,12; 8:9; 9:9,10; 10:4,10; 11:9; 12:8,9
——, geographical distribution ... 7:13; 11:10
——, vaccine, free distribution in Kansas ... 5:10
Ulcers, stomach and duodenal deathrate, 1921-1930 ... 6:3
——, sex, age and color ... 6:4,5
UNITED HEBREW CHARITIES ... 7:2
UNITED STATES PUBLIC HEALTH SERVICE ... 1:10; 2:10
——, Division of Mental Hygiene ... 3:10; 4:10
——, health needs in drought area ... 12:10
University of Pennsylvania Graduate School of Medicine, cancer control center ... 6:10
WAR DEPARTMENT, Medical Division ... 8:6
WHITE HOUSE CONFERENCE ON CHILD HEALTH AND PROTECTION ... 7:5
Whooping cough, decline of mortality, 1911-1930 ... 9:7
——, New Jersey, 1927-1929 ... 9:8
——, 1930 ... 1:2
——, new minimum deathrate ... 1:3
——, 1931 ... 4:7; 5:9; 6:9; 7:9; 9:9; 12:8
WOMEN'S CLUBS, GENERAL FEDERATION OF. 3:5
World Population Congress in 1927 ... 5:8

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12:2
12:3
12:4
12:3
12:3
5:7
5:8
5:10
7:4
12:5
12:5
2:4
6:1
12:8
8:2
8:4
8:4
8:10
8:10
6:1
1:10
1:3
12:8,9
11:9
7:13
1:10
5:6
5:3
12:9
12:9
5:10
7:7
4:10
6:2
2:4
1:7
10:5
8:5
3:2
3:2
3:2
3:3
2:2
9:1
6:1
2:4
1:2
12:8
11:10
6:10
8:5
6:1
2:4
12:8,9
11:10
5:10
6:3
6:4,5
7:2
2:10
4:10
12:10
6:10
9:6
7:5
9:7
9:8
1:2
1:3
12:8
3:5
5:8

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